

CALIBRATION OF DOWNLINK AND UPLINK CHANNEL RESPONSES IN A WIRELESS MIMO COMMUNICATION SYSTEM

ABSTRACT

The downlink and uplink are calibrated to account for differences in the responses of transmit and receive chains at an access point and a user terminal. For initial calibration, the access point and user terminal transmit MIMO pilots on the downlink and uplink, which are used to derive channel estimates including the responses of the applicable transmit/receive chains. Correction matrices $\hat{\mathbf{K}}_{\text{ap}}$ and $\hat{\mathbf{K}}_{\text{ut}}$ are derived based on these channel estimates and thereafter used by the access point and user terminal, respectively. For follow-on calibration, one entity transmits a MIMO pilot and a steered reference. The other entity derives a first transmit matrix based on the steered reference and a second transmit matrix based on the MIMO pilot and calibration error matrices \mathbf{Q}_{ap} and \mathbf{Q}_{ut} , which contain estimates of the errors in $\hat{\mathbf{K}}_{\text{ap}}$ and $\hat{\mathbf{K}}_{\text{ut}}$, respectively. \mathbf{Q}_{ap} and \mathbf{Q}_{ut} may be iteratively adjusted based on an adaptive procedure to minimize the errors between the two transmit matrices.